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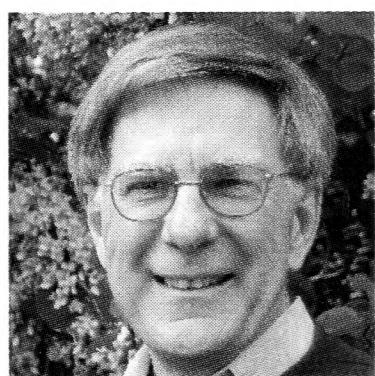
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The Ambika Connection



When female Asian elephant Ambika came from India to the Smithsonian's National Zoo in 1961, few had any inkling that nearly 50 years later she would represent a species vanishing from the wild—or that the National Zoo would be at the forefront of the struggle to save Asian elephants (see "A Trunk Full of Memories," page 24). With its extensive research on elephants, and its development of the state-of-the-art Elephant Trails program, the National Zoo is committed to ensuring a future for these amazing animals both in the wild as well as in North American zoos, including ours.

Some ask whether it is important or necessary to maintain elephants (or any species) in zoos, questioning how zoos contribute to conservation. But the results of a recently published study, funded by the National Science Foundation, provide a strong answer. In this three-year study, called "Why Zoos & Aquariums Matter: Assessing the Impact of a Visit," the researchers interviewed 5,500 visitors at 12 North American zoos accredited by the Association of Zoos and Aquariums to determine whether the public who visit zoos and aquariums come away with a better understanding of wildlife and the conservation of the places where animals live. The answer was a resounding endorsement for the conservation vision of zoos and the support provided by members like you.

Among the study's key findings, one was: "Visits to accredited zoos and aquariums prompt individuals to reconsider their role in environmental problems and conservation action, and to see themselves as part of the solution." At times, we feel somewhat helpless in knowing how we can make a difference in conserving species, like Asian elephants, that live in faraway places and are threatened by habitat loss and other forces. But, as this study shows, zoos can inspire people to help animals, whether directly or indirectly. Even small changes in our everyday activities, such as ensuring that the coffee we drink is grown in the shade (see "Drinking Green," page 16), can have impacts on wildlife conservation. Visit our website at www.fonz.org/greentips.htm for more ideas on how each of us can take action to help.

Another important finding of the study was: "Visitors believe they experience a stronger connection to nature as a result of their visit." Without that connection there would be little concern or support for wildlife and their habitats. At FONZ, it is our mission "to connect people with wildlife." It is heartening to learn from this study that zoos are building this essential bond.

I encourage you to visit Ambika this summer and join us for Celebrate Asian Elephants on August 23. Ambika has spent her long life enriching our experience of the natural world. Asian elephants and so many other species of wildlife need our continuing support to retain their place on our crowded planet.

I also invite you to join me in welcoming Cindy Han as the new editor of *ZooGoer*. She is looking forward to keeping you connected to wildlife through the pages of this magazine. Please watch for the next issue of *ZooGoer*, coming in November, for more great stories from the National Zoo.

Sincerely,

Bob Lamb

Executive Director, Friends of the National Zoo

FONZ is the dedicated partner of the Smithsonian's National Zoological Park. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital.

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On the cover: The Smithsonian National Zoo's oldest Asian elephant (*Elephas maximus*), Ambika, turns 60 this summer. Photo by Jessie Cohen/NZP.

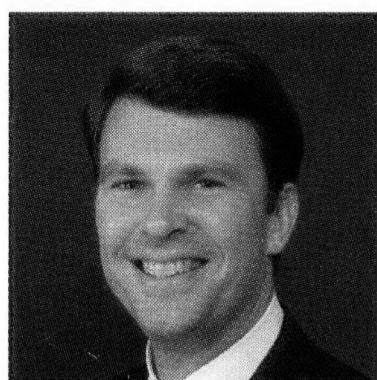
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Saving Asian Elephants—Here and Now



Elephants evoke an emotional response in most people—I know they do in me. I have grown up with Ambika, our 60-year-old Asian elephant, here at the Smithsonian's National Zoo. She arrived in 1961, when I was two. We have been friends ever since. Elephants are among the most intelligent and social of creatures and their massive yet gentle presence inspires awe and respect.

Yet elephants are endangered. While we appreciate the majesty of these animals, we must recognize the need for humans to help them in their struggle to survive. The National Zoo strives to meet that need through education, research, and our daily commitment to their care and conservation.

In Asia, human-elephant conflict and habitat loss have reduced elephant populations to levels threatening extinction. Zoo scientists are finding ways to help. Biologist Peter Leimgruber, based at our Conservation and Research Center (CRC) in Front Royal, Virginia, conducts research on how satellite tracking techniques can help conserve and manage various animal species. He has led operations in places like Burma and Sri Lanka to put radiocollars on Asian elephants in the wild. The information he gathers allows scientists to track the elephants' movements and map their remaining habitats.

The recent, devastating natural disasters in Asia reinforce the fragility of endangered species populations. Asian elephants are native to the affected countries. A natural disaster could wipe out entire populations of these magnificent creatures. Our efforts to save Asian elephants through our work both at zoos and in the field are among our profession's utmost priorities.

Currently, the Asian elephant population in zoos is not self-sustaining. Research on elephant reproduction conducted at the Zoo's CRC plays a vital role in the breeding that occurs at zoos nationwide. The Zoo's reproductive expert Janine Brown has led those efforts admirably (see "Hooked on Elephants," page 26), but she can't aid the births of animals in the wild. If a natural or man-made disaster were to eliminate the wild Asian elephant population tomorrow, we would not have enough Asian elephants—or the genetic diversity needed for generations of healthy offspring—to be able to reintroduce them into the wild. That is not a good insurance policy.

In all of our work, we must also be conscious of the moral and ethical issues that humans should heed in our work with elephants. How do our actions affect these animals? This is the important subject of the new book *Elephants and Ethics* that National Zoo researcher Catherine A. Christen helped to edit, with significant input from several Zoo colleagues.



Ambika knows how to create a splash.

In addition to all of our worthwhile research on elephants, we have been hard at work to make Elephant Trails: A Campaign to Save Asian Elephants a reality here at the National Zoo. Once completed, we will have a world-class home for a group of up to ten adult female Asian elephants, their calves, and individual bulls. With room to roam, the herd will be able to socialize, forage, and exercise together, much as they would in the wild. In addition, the exhibit will serve as the site for our top-notch breeding, research, and education programs. Elephant Trails will allow us to foster the Zoo population of Asian elephants and engage our nearly three million visitors each year about the wonder and importance of this species.

You will see plenty of progress in our Elephant Trails construction as you visit this summer. We hope to open the exhibit in July 2011. To learn more about the plans and how you can help, go to www.fonz.org/elephanttrails.htm.

From all of us at the National Zoo, thank you for joining us in our commitment to this beloved species.

Sincerely,

A handwritten signature in cursive ink that reads "John Berry".

John Berry
Director, Smithsonian's National Zoological Park

Animal News

Greater rhea chicks (*Rhea americana*) pop their heads up to greet each day at the Smithsonian's National Zoo, outside the Bird House. Since they hatched in April, the chicks have been well cared for by their father, which is the custom among rheas and their relatives, such as ostriches and emus. Even after the chicks hatch, the male will continue to sit on them at night to keep them safe and warm. He'll also hiss at the chicks' mother as she tries to approach.

This is the first time in 23 years that the Zoo has hatched greater rhea chicks, and the keepers are making sure to provide them with a proper diet. Most birds need to eat some sort of grit to develop their digestive systems, but baby rheas need something tougher for their muscular gizzards—so they've been eating ground-up granite. It must be working, because the four chicks (two boys, two girls) are growing fast. They'll be at the Zoo until the fall, when they'll be sent to zoos in other states.

Coming outside to explore this summer is a **tammar wallaby joey** (*Macropus eugenii*). The young wallaby was born last fall, but spent several months in the mother's pouch, nursing, sleeping, and growing. Tiny newborn wallabies crawl up into the pouch by pulling themselves by the mom's fur, which the mother licks to create a trail for the baby to follow. "It's a tough journey," explains National Zoo assistant curator Tony Barthel. "If they lose their grip or get lost, there's no help for them. As a result, some don't make it." Fortunately, this joey did make it, eventually peeking

out of the pouch, then poking other body parts out gradually. By spring, it was able to climb out of the pouch at will, diving back in when startled. This summer it will be out and about in the wallaby exhibit, near the zebras, although it may still be challenging to spot the youngster among the vegetation.

Visitors to the Zoo's Asia Trail can now see **red pandas** (*Ailurus fulgens*) Shama and Wicket in their renovated exhibit yard. The brother and sister were born last July at the Zoo's Conservation and Research Center (CRC) in Front Royal, Virginia. Does that face look familiar? Red pandas are not bears like giant pandas—they're relatives of the American raccoon. Like giant pandas, however, red pandas evolved special paws to help them grip bamboo, one of their diet staples. Zoo scientists have been studying and breeding red pandas since 1972 with the long-term goal of reintroducing the species to the wild. Red pandas are threatened by habitat loss in the Himalayas and China.

New litters of **black-footed ferrets** (*Mustela nigripes*) were born this spring at CRC. Once thought to be extinct, the black-footed ferret is the focus of an ongoing research project at CRC, with scientists using artificial insemination techniques to try to enhance reproduction, maintain genetic diversity, and reintroduce the animals to the wild. In the past, CRC-born ferrets have been released in parts of the western United States. As the only wild ferret native to North America, the black-footed ferret is still listed as endangered.

A first-ever medical procedure was performed on one of the Zoo's **Przewalski's horses** (*Equus ferus przewalskii*; *Equus caballus przewalskii*—classification debated). The genetic makeup of this male horse, Minnesota, is extremely valuable to the captive population of the species, which was declared extinct in the wild in 1970. Przewalski's horses are native to China and Mongolia; there are now about 1,500 of them at zoos throughout the world.

Minnesota has been ranked the seventh most genetically valuable horse in the North American breeding program, but he could not breed because he was vasectomized in 1999 at another institution. Zoo scientists decided to seek the expertise of Sherman Silber, a urologist who pioneered reverse vasectomy techniques in humans. This spring, he was able to perform the first successful reverse vasectomy on an equid. Now Minnesota will be able to sire a foal through natural mating again—good news for the future of this endangered species.



Greater rhea chicks, tammar wallaby joey, red panda, Przewalski's horse.

Helping Hand

The Smithsonian National Zoo community is extending aid to the Wolong Giant Panda Breeding Center and Reserve in the wake of the devastating May 12 earthquake in China and its continuing aftershocks. The Zoo has built a relationship of more than 20 years with the Wolong Center, where our two adult giant pandas, Mei Xiang and Tian Tian, were born. Located right near the earthquake's epicenter, the Wolong Center suffered significant damage.

In the face of this disaster, the Zoo is rallying to help the Wolong community as well as the giant pandas. With your support, we can help provide the necessary resources for the staff to begin rebuilding the breeding center, and to continue to provide quality guardianship for the pandas. Please consider making a donation to the earthquake relief effort by July 15; to learn how, visit our website at www.fonz.org/giantpandas.htm.



Mei Xiang was born at the Wolong Center in China.

Exhibit News

Construction of the Zoo's Elephant Trails is moving along on schedule. Renovations to the Elephant House have begun in order to make room for a large indoor "community center." Excavation for the basement of the new habitat is underway, as is the drilling of the 450-feet-deep geothermal wells that will be used for the heating and cooling of the new facilities. Golden Lion Tamarin Walk, Beaver Valley Walk, and Bird House Road remain off limits to the public during this phase.

Elephant Trails is scheduled to be complete in 2011, when the Zoo's elephants will have access to expanded areas both indoors and out.

Take a virtual trip behind the scenes at the Zoo. Visit www.fonz.org/diary.htm to read Erika Bauer's latest diary entry about being a Zoo Leader in Training.

Events

Come to the Zoo for cool summer fun. For more information, visit www.fonz.org/events.htm.

Sunset Serenades

Thursdays from June 26 to August 7, 6:30–8 p.m.

Bring your family and friends to Lion/Tiger Hill this summer to enjoy free concerts and meet Zoo animals up close. Listen to jazz, blues, oldies, patriotic music, classic rock, and Zydeco while you picnic on the hillside or enjoy refreshments from the Zoo's Mane Restaurant. Visit www.fonz.org/sunsetserenades.htm for a concert schedule.

Brew at the Zoo

August 21, 6–9 p.m.

Enjoy handcrafted beer and mingle with the animals at Brew at the Zoo, FONZ's after-hours event for young professionals. Sample beers from more than 20 different microbreweries and hors d'oeuvres from local restaurants while listening to live entertainment. Funds raised at Brew at the Zoo support animal care, conservation science, education, and sustainability at the Zoo. For information about tickets, visit www.fonz.org/brew.htm.



Celebrate Asian Elephants

August 23, 10 a.m.–4 p.m.

From food to fundraising, enrichment to education, it takes an entire zoo to care for an elephant. As a testament to the Zoo's commitment to Asian elephant care and conservation, our oldest female elephant, Ambika, is turning 60 years old this year. At Celebrate Asian Elephants, visitors can celebrate Ambika's life and learn all about what it takes for Zoo staff to care for our elephants from day to day. Look for animal demonstrations, educational exhibits, and activities for the whole family. The Sri Lankan Embassy will join the celebration, offering food and entertainment. Visitors will also have the opportunity to donate a gift toward the care of the Zoo's elephants. Visit www.fonz.org/events.htm for more information about the celebration.



BY blackbird

Rusty blackbirds are vanishing from our southern swamps and northern forests.

BY RUSSELL GREENBERG

Winter is a quiet, gentle time in the southern swamp. Gone are the biting insects, venomous snakes, and toothy alligators, so wading in the swamp is relatively easy and safe. At first, the swamp seems dead, swept clean of summer's teeming life. But as your hip waders quietly slosh through the puddles and pools, bird life slowly reveals itself. At first, you hear it: the chatter of chickadees, the soft chip notes of yellow-rumped warblers (*Dendroica coronata*) drifting through the canopy, the tapping of a woodpecker, and the explosive "tea kettle, tea kettle, tea kettle" of a Carolina wren (*Thryothorus ludovicianus*). Then come the visuals: a flock of American robins (*Turdus migratorius*) dropping into a fruiting holly, or the black-and-white flashing wings of a pileated woodpecker (*Dryocopus pileatus*).

If you walk long enough, occasionally—very occasionally—a black bird slightly smaller than a robin might pop up in the tree branches and peer at you with piercing white eyes.

If you then silently scan the ground, you may see a troop of these birds, some blackish, others a rich rusty color. They will be diligently marching around the edges of leaf islands and wading the puddles, methodically searching the mud, flipping leaves, vigorously shaking wet green globs of vegetation in their bills, then pecking madly for any exposed invertebrates. Every so often, one of them wins a grand prize—a large, juicy insect larva—rapidly swallows it, and unceremoniously hunts on. A flock of birds at work.

Despite the activity, the flock is oddly quiet, uttering only a few soft contact calls. Then they are gone, as if sucked back into the mire. If you have such a chance encounter, you should feel very lucky. Seeing the highly elusive rusty blackbirds (*Euphagus carolinus*) is special. They are sighted less and less often, and the size of the flocks has dwindled from the thousands to the tens.

Birders often know special spots where the odds of sighting wintering rusties are greatest. Around Washington, D.C., the Jug Bay wetlands on the Patuxent River or the McKee-Beshers Wildlife Management

Area along the Maryland shore of the Potomac River often host small flocks. So do the Kenilworth Aquatic Gardens in the District and Huntley Meadows Park in Virginia. But it wasn't always so hard to find rusty blackbirds.

A History of Decline

At the beginning of the last century, most observers noted rusty blackbirds as common to abundant. But as their bottomland hardwood habitats disappeared, so did the birds. After the Civil War, ornithological pioneer Elliott Coues described the bird as an abundant winter resident of Washington, D.C., and the surrounding region. Not anymore. Now most ornithologists describe them as rare or uncommon, and unpredictable throughout their winter range, which covers much of the southeastern United States.



Like most North American birds, rusty blackbirds are migratory. They breed in boreal forest wetlands in summer, slowly drift south from October through December, then rush back north in late March and April to claim territories. These seasonal treks bring them to the favorite haunts of the Northeast's armies of birders. This is when most rusty blackbird sightings occur—and when the decline of the species is most obvious.

Although birders still regularly see small groups of these birds, it would be hard to imagine reading reports like the following on your favorite birding listserv. Almost 130 years ago, the minister-ornithologist J. H. Langille reported:

On the first day of May 1880, as I stood on an iron bridge crossing a sluggish stream of

Tonwanda Swamp, I saw the Rusty Grakles constantly trooping by in immense numbers.... The sombre wave, this constantly rolling on, must have carried hundreds of thousands over this highway in a day....on being alarmed, either in the fields or in the bushes, these Grakles would rise in a dense, black cloud, and with a rumbling sound like that of distant thunder.

At about the same time, Frank E. Beal, a U.S. Biological Survey scientist and founder of the field of economic ornithology, wrote:

One of the most familiar sights to the New England schoolboy, and one which assures him that spring is really at hand, is a tree full of blackbirds, all facing the same way and each one singing at the top of its voice. These are rusty blackbirds.... In their migration they are seen in immense numbers, especially in the Mississippi Valley.

And the following quote from Ernest Thompson Seton, intrepid naturalist of the Manitoba wilderness, is my favorite of this genre:

An enormously abundant migrant.... The thousands of Grackles have been increased to tens of thousands. They blacken the fields and cloud the air. The bare trees on which they alight are foliated by them. Their incessant jingling songs drown the music of the Meadow Larks and produce a dreamy, far-away-effect, as of myriads of distant sleigh bells.

Rusty blackbirds may not have been as abundant as passenger pigeons (*Ectopistes migratorius*), immense flocks of which darkened the skies for hours on end, but it does appear that the birds' numbers aren't what they used to be. Given a breeding distribution that stretches from Maine to the tree line in Alaska, the species would appear on a map to be widespread and abundant.

However, the historical record suggests a catastrophic decline in numbers, a record all the more sobering because American history is replete with once-abundant birds that suffered catastrophic declines, some all the way to extinction.

Rusty blackbirds appear to have disappeared from significant portions of their former breeding range.

The Science of Decline

However compelling and poetic the accounts of naturalists of the past, conservation biologists are hard scientists who demand hard data—quantitative estimates, trend lines, population projections—to ensure that an apparent decline is real. Fortunately, although rusty blackbird populations are difficult to survey, two broad-scale survey programs and several more local studies provide a paint-by-numbers picture of the last few gloomy decades of the rusty blackbird's history.

More than 40 years ago, visionary ornithologist Chandler Robbins and his colleagues at the Patuxent Wildlife Research Center (now part of the U.S. Geological Survey or USGS) established the continent-wide Breeding Bird Survey (BBS), which organizes volunteers to survey birds along some 3,000 miles of secondary roads each summer. Because there are few roads and even fewer birders in much of the rusty blackbird's summer range, the BBS data on this species are spotty and meager. Population trend estimates are based on fewer than 100 routes scattered from Maine to Alaska. Still, USGS and Canadian Wildlife Service (CWS) statisticians show a robust decline

Rusty blackbirds (*Euphagus carolinus*) might be spotted in shallow swamp waters, poking through the muck for their meals, or perched on trees.





in rusty numbers that surpasses almost all other North American birds in the steepness of its descent. The 40-year trend for the species is phenomenally depressing: 12 percent per year, or a whopping total decline of more than 97 percent over four decades.

The wintering ground, located largely in the southeastern United States, is mostly accessible, making annual winter counts there much more complete, thanks in part to one of the greatest events on the bird-watching calendar for the past 50 years—the Christmas Bird Count (CBC). Birders participating in a CBC record all the feathered creatures they encounter in one day within a 15-mile-diameter circle. The rusty blackbird's winter range is dotted with more than 1,600 "count circles" within which the birds' relative abundance has been reported over the past 40 years. National Audubon Society ornithologist Daniel Niven, working with John Sauer at the Patuxent Wildlife Research Center, has kept tabs on the CBC numbers for the rusty blackbird. The story is clear: The estimated annual decline is 4.5 percent per year, or an 85 percent decline over the past four decades.

Finally, rusty blackbirds have not only declined in numbers but appear to have disappeared from significant portions of their former breeding range. Experiencing this myself is what captured my interest in the species. In the mid-1990s, I was comparing the ecology of boreal forest birds in Russia with those in Canada. My field teams and I spent two summers surveying and recording foraging information on birds in the southern portion of the Northwest Territories and the boreal zone of Ontario. Despite accumulating a very complete species list for the region, we failed to see any rusty blackbirds in the Northwest Territories. We found just one pair in Ontario. I found this frustrating and embarrassing because earlier regional accounts described the bird as reasonably common.

Since then, however, the CWS has conducted far more comprehensive bird surveys in nearby Alberta and Saskatchewan with a similar result: a handful of sightings among thousands of systematic point surveys scattered throughout the boreal zone. Other surveys in Maine and other northern U.S. states and in the Maritime

Provinces of Canada also recently revealed that rusties have disappeared from parts of their former range. The only good news is that similar surveys in western Canada and in northern Ontario have failed to find any signs of decline in these far north regions.

Slow Response but Picking Up Speed

Despite its near-catastrophic magnitude, ornithologists and conservationists were a bit slow in recognizing and reacting to the rusty blackbird free fall. In 1999, USGS scientist Sam Droege and I published a paper in *Conservation Biology* that outlined the evidence of the species' demise. But it would be at least six years before a comprehensive effort would be mounted to understand what was going on with this bird.

The reasons for the delay are simple. The species is pretty obscure and, until recently, birders probably didn't think much about them. More important, the rusty blackbird is a blackbird, related to species such as the red-winged blackbird (*Agelaius phoeniceus*) that benefit from human development and take full advantage of the fruits of



About a century ago, massive flocks of migrating rusty blackbirds darkened the skies, but now birders rarely see such impressive sights.

American agriculture. In fact, as a group, blackbirds are often legally classified as pest species and subject to control efforts. For example, as part of a U.S. Department of Agriculture (USDA)-APHIS control program, surfactants, which destroy the insulating ability of feathers, were sprayed on 83 wintering multispecies roosts in three states between 1974 and 1992, freezing to death more than ten million blackbirds. These included an estimated 100,000 rusties, even though rusty blackbirds are not pests, but primarily insect-eaters and feed on grain only on occasion. Although blackbird control at such a grand scale is no longer practiced, rusties often roost with other blackbirds and get caught up in the slaughter. So, given that rusty blackbirds are just another blackbird and that blackbirds are perceived as, at best, very successful around humans and, at worst, as economic pests, it was hard to imagine that this particular species could be in trouble.

Making up for lost time, conservation biologists now pay a lot of attention to the rusty decline. In 2005, a team of more than 20 Canadian and U.S. scientists formed the

International Rusty Blackbird Technical Working Group (IRBTWG), which spawned research and monitoring projects in Alaska, the southeastern United States, New England, and Canada.

The group's research has taken flight in the last two years. Winter work, conducted primarily in the Lower Mississippi Alluvial Valley (LMAV), but soon to expand to the Carolinas, has focused on banding and radiotracking birds in different habitats. Using these techniques, Claudia Mettke-Hofmann, a biologist from John Moores University in Liverpool and a Smithsonian National Zoo research associate, and her colleagues have found that rusties feeding in more disturbed habitats join enormous mixed blackbird roosts in cities, where they are subject to control efforts and harassment, whereas forest birds spend the night in small country roosts in old fields. Other scientists are developing statistically sound ways to monitor populations and are attempting to tie population declines to land-use changes in the region.

Studies are also well underway at the extreme edges of the breeding grounds,

where studies of habitat use and nesting outcomes reveal surprisingly high levels of nesting success, suggesting that reproductive failure may not be playing a role in the decline. In another effort, scientists mapped the migratory paths of rusty blackbirds and discovered that rusty blackbirds use two distinct flyways: Birds wintering in the LMAV come from western Canada and Alaska and birds found in the Atlantic Coastal Plain originate in eastern Canada or the northeastern United States.

Why Are Rusties Disappearing?

To figure out how the rusty blackbird arrived at its current perilous state, we have to figure out what unique aspects of its ecology might make it vulnerable. Basically, despite their taxonomy, rusties are the un-blackbird. On the wintering grounds, they are ecological specialists. There, they seem to favor shallow, fluctuating surface water, beneath or surrounded by the forest canopy, where they forage in recently exposed mud and detritus. Think of them as forest shorebirds. They appear to like it

best when this muck and mire warms up, perhaps explaining their slow drift to the south as winter progresses.

As an alternative to invertebrates, they also feed on the tiny acorn mast, or tree nuts, that accumulate on the ground beneath water-loving oaks such as the willow oak (*Quercus phellos*). The mast may provide sustenance when conditions aren't right for searching for insects and small fish in vernal pools.

Winter habitat loss and degradation, as well as climate change, environmental pollutants on the breeding grounds, and the effects of past blackbird-control efforts are among the possible reasons for the decline of the rusty blackbird.

A taste for tree nuts also leads rusties to the most important agricultural crop in the LMAV, farmed pecan trees. Mettke-Hofmann found that dominant individuals in prime condition, mostly adult males, feed on pecan scraps left after common grackles (*Quiscalus quiscula*) process the large, tough nuts.

Thinking about habitat from the blackbird perspective, not only has at least 75 percent of the bottomland hardwoods in the southeastern United States been converted to agriculture and other land uses, but the flood waters of rivers and creeks—whose ebbs and flows create the ephemeral wetlands the species seems to crave—have been tamed. For example, about 90 percent of the mighty Mississippi's floodplain is now bound and controlled by levees, where the soils may have too much or too little water and fluctuations are dampened.

Then there are the boreal breeding grounds. Because of the boreal forest's vastness and inaccessibility, conservationists until recently were not too concerned about it. But that is changing. For instance, a new Boreal Songbird Initiative is examining the impact of increasing development, as well as global climate

change and environmental pollutants, on the birds of this anything-but-pristine region. It is particularly disturbing that other boreal wetland species, from sandpipers to ducks, are in decline.

Rusty blackbirds breed in a variety of boreal wetlands and depend upon aquatic macroinvertebrates, such as dragonfly larvae, to feed themselves and their young. Changes in the ecology of these macroinvertebrates often indicate ecological

pollutants on the breeding grounds, and the effects of past blackbird-control efforts are among the possible reasons for the decline of the rusty blackbird. People in the know have proposed other plausible causes. When a species declines so precipitously and you don't know why, anything is possible. And it may be like Agatha Christie's *Murder on the Orient Express*, in which all of the suspects did it.

First Steps

Clearly, much more research is needed. In terms of acquiring basic knowledge of the birds, we've been trying to accelerate from virtually zero to sixty in no time flat. Furthermore, all of the hypotheses to account for the rusties' decline must be crafted into specific predictions and rigorously tested, a process that has just begun. However, as practical-minded conservationists faced with a crisis, we can also take some common-sense management actions based on what we already know.

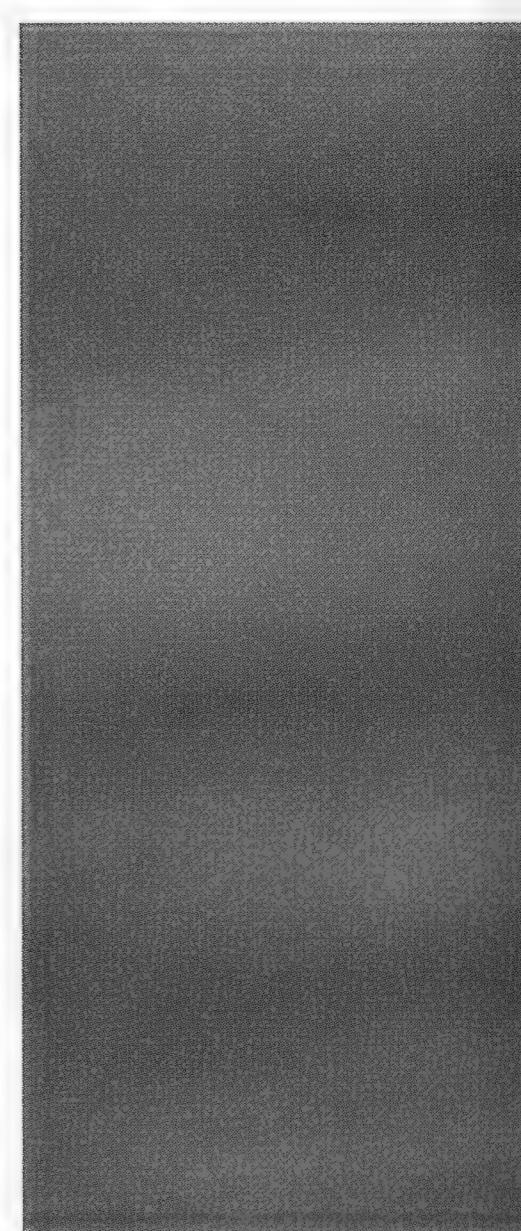
The clearest area for action is management and recovery of the bird's winter habitat. The protection of bottomland hardwood habitats is a very hot conservation topic, thanks in part to the buzz around

disturbance. For example, an increase in subarctic temperatures has led to wetlands drying up and permafrost melting in boreal wetlands. Evidence suggests that this causes a major shift from a system in which aquatic plants are grazed by macroinvertebrates to one in which plankton—tiny floating plants and animals—dominates. Such a change in the food chain could easily affect the ability of rusty blackbirds to grow and fatten their young. Robin Corcoran of the U.S. Fish and Wildlife Service has already documented detrimental effects of this change on boreal-breeding ducks.

Finally, rusty blackbirds often breed in peat wetlands, which are particularly sensitive to acid rain. Mercury is another industrial pollutant that is carried through the atmosphere and deposited in the boreal wetlands, particularly in eastern Canada and New England. Mercury is very toxic to birds (and people) and appears to accumulate high sub-lethal doses in rusty blackbirds and other invertebrate foragers in these systems, according to recent research by David Evers at the Biodiversity Institute in Maine.

Winter habitat loss and degradation, as well as climate change, environmental

Some studies show that rusty blackbirds act fearful of new environments. Habitat recovery is crucial to their survival.



ivory-billed woodpecker (*Campetherus principalis*) habitat recovery plans. But simple protection of bottomland hardwoods alone might not do it. Habitat needs to be restored and improved.

Much of the remaining hardwood forests on some of the wettest agricultural lands in the LMAV was cut down and replaced with soy bean farms in the 1970s. But the recent collapse of soy bean prices has led to concerted efforts to replant these forests. Research on how to enhance recovery areas with willow oaks and other mast species that will support blackbird populations should be an immediate management objective.

Finally, water levels in the very same impoundments that tamed the natural, ephemeral flooding of southern rivers and creeks could be drawn down so they are low and fluctuating during critical parts of the winter, and thus managed for rusty blackbirds and other wildlife that take advantage of this highly productive system. Of course, some of the threats haunting blackbirds—such as airborne contaminants, acid rain, and global warming—require major societal solutions that go well beyond the management of a particular species or even ecosystem.

Fear of the Unfamiliar?

I often think about what accounts for winners and losers in rapidly changing human-dominated landscapes. It is entirely possible that the way that specialized species, such as rusty blackbirds, approach the world psychologically differs fundamentally from that of more ecologically adaptable species, such as most other blackbirds. Mettke-Hofmann ran some fascinating field experiments to see if blackbird species differed in neophobia, or their fear of novelty. By placing novel objects next to feeding stations, she showed that, of all the blackbirds she tested, rusty blackbirds are the most fearful of feeding near unfamiliar objects. In a practical way, these results explain why it has proven so tricky to catch and, hence, study the birds: They are wary of any new additions to their environment, such as traps or mist net poles, in a way that other blackbirds are not. But from an ecological perspective, the results may also provide insight into a species that is simply more mentally conservative than its relatives and less able to cope with rapidly changing habitats.

With these thoughts in mind, it is with some irony that I close with the story of where I acquired my life-list rusty black-

bird. I found it while birding with my family on a crisp November day almost 30 years ago, at the alkaline pool of Saratoga Springs at the southern tip of Death Valley, California. Many migratory birds occur as vagrants outside their normal range—even the declining rusty blackbird. I was fascinated to watch a species, so typical of the wettest habitats in North America, busily foraging in a desert that receives less than two inches of rain per year. Without apparent fear of its alien surroundings, the lost blackbird was hunting endangered desert pupfish (*Cyprinodon macularius*) in the shallows, just as it would fish for minnows in a swamp. At the time, I felt sorry for the threatened fish population being depredated by a blackbird, of all things. But looking back, I understand I was watching two casualties in the battle between biodiversity and human development—a fact that took me two decades to figure out. *Z*

—Russell Greenberg is head of the Smithsonian Migratory Bird Center at the National Zoo and a founding member of the International Rusty Blackbird Technical Working Group. Go to <http://nationalzoo.si.edu/goto/RustyBlackbird.htm> to learn how you can help.







drinking **GREEN**

by Robert A. Rice

With the first rays of the morning sun slanting through the trees, I made my way through the coffee farm of a small landowner in Chanchamayo, Peru's central coffee-growing region. At 4,300 feet on the eastern slopes of that rugged backbone of South America known as the Andes, the morning was still

and somewhat foggy. The dawn chorus of the local birds—both resident and migratory—was at full volume, accompanied only by the sound of my own breathing and the rustle of my steps on the thick leaf layer on the ground. As always, I marveled at how a shade-coffee farm had all the earmarks of a forest.



**What look like
forested mountains
in Latin America
are often actually
a canopy of trees
above shade-coffee
farms.**

But coffee farm it was—an agroforestry system with an organic certification. The shade-tree canopy over the coffee bushes created a green cathedral-like setting.

Spiderwebs stretching between the bushes spoke of the abundant insect life, which provides food for birds and an array of other animals. Bromeliads adorned overhead limbs, adding to the overall plant diversity of the farm.

A flash of faded red from a summer tanager (*Piranga rubra*) undergoing its annual molt caught my eye. This bird had made its way here from somewhere in North America, and settled on the small Peruvian coffee farm for its seven- to eight-month stay in the tropics. Farther along, a black-and-white warbler (*Mniotilla varia*) ran up and down, over and under the trunk and branches of a towering tree, one of many that the farmer manages to shade this crop. This same warbler might have bred a few months earlier in the upper reaches of the eastern United States or Canada, or perhaps in the cool cove forests of Appalachia—where high elevation

creates conditions that mimic the higher latitudes where most of these warblers probably go to breed.

Farms like this one have jumped head first into the flood of sustainably grown coffees now in the marketplace. Many are certified in some way to bolster their appeal to niche consumers. Some are certified organic. Some are certified as creating good habitat for birds. Others make claims to fair trade, a social certification that benefits small, historically marginalized growers. It is within this roiling mix that some Smithsonian National Zoo scientists currently find themselves—not merely because their research interests are geared toward conserving birds on managed lands, but because they have created a certification mark directly linking their research, the marketplace, and conservation.

How did the scientists at the National Zoo get involved in the coffee business? In

fact, the work of Smithsonian Migratory Bird Center (SMBC) staff researchers led us into coffee farms quite literally. In the late 1980s and early 1990s, Smithsonian ornithologist and SMBC Director Russell Greenberg was studying the distribution of Neotropical migratory birds in their Mexican wintering grounds when it clicked: He realized that many apparently forested mountainsides in Mexico's southern state of Chiapas were actually landscapes blanketed with farms of coffee grown under a shade canopy of taller trees—the traditional way this shade-loving plant is grown.

Surprisingly, these agricultural lands—areas ignored historically by conservation biologists—revealed great potential for acting as refuges for biodiversity, especially given that so much natural habitat was disappearing. Studies there and elsewhere in Latin America bore out one of the principal findings from Chiapas: Coffee farms managed in certain ways that include a shade cover resembling forest cover—a coffee agroforest—can provide relatively good habitat for birds and other creatures. And they certainly offer better wildlife habitat

Seals of Approval

Apart from the Smithsonian's Bird Friendly seal of approval, the major environmental seals consumers see on coffee are USDA Certified Organic and Rainforest Alliance Certified. Other seals primarily address the social and economic aspects of coffee production or trade, such as guaranteeing that farm workers are not exploited and that no child laborers are used, but some also consider environmental concerns. Among these are the Fair Trade certification and Utz Certified (formerly Utz Kapeh). Starbucks has its own set of criteria—the C.A.F.E. Practices—for purchasing coffee that include both social and environmental check offs. These initiatives overlap to varying degrees in the criteria they use for certification and some coffee farms have multiple certifications. For instance, many Bird Friendly-certified farms are also Fair Trade-certified.

The certification process for any of these seals is roughly the same. Coffee producers must implement or maintain practices and policies that meet the specified criteria, submit their farms to an initial certification inspection, and agree to regular inspections to maintain their certification. They pay a price for all of this, but they also stand to receive price premiums from buyers because of the certifications.

than the alternative—plantations of “sun coffee,” varieties that grow without shade but that also require substantially more inputs of fertilizers and pesticides.

To promote shade-grown coffee, and to discourage conversion of shaded coffee farms to sun-coffee farms, the SMBC examined the specialty coffee sector and developed its Bird-Friendly certification program.

Certified Organic

In 2005, the U.S. Department of Agriculture established a set of regulations for labeling agricultural products as “organic.” Most consumers are now familiar with the green USDA Certified Organic seal, which is found on coffee as well as other packaged foodstuffs and on cosmetics and the like. But the organic community existed long before the government became involved, and coffee is no exception. Certified-organic coffee began making in-

roads into the U.S. market in the late 1980s and early 1990s, when a San Diego importer named Karen Cebreros introduced organic coffee from northern Peru to U.S. roasters. At first, it was considered an inferior-tasting coffee that managed to survive in the marketplace only thanks to eco-minded consumers' solidarity with organic producers. The taste issue, a result of small producers having trouble with quality control, has since been successfully addressed. Certified-organic coffee has emerged as the fastest-growing part of the specialty coffee industry today.

The standards for certifying coffee—or any crop—as organic are based on the health of the soil. Use of synthetic agrochemicals is verboten, but the main thrust is to maintain ecologically active soil. Guidelines for soil amendments, erosion-control techniques, and the enhancement of soil micro- and macrofauna all aim to create a rich and fertile substrate for the crop. This program encourages farmers to grow coffee under shade in the traditional fashion, and further specifies that 80 percent or more of the shade trees must be

native to the growing area and provide 40 percent foliage cover.

Geographically, certified-organic coffee is produced in all three of the major coffee-growing regions—Africa, Asia, and Latin America—with Latin America producing the lion's share. Mexico and Peru stand out as the top producers in this hemisphere. In 2006, thousands of farms, collectively covering about 800,000 acres of land—an area roughly equivalent to that covered by Yosemite National Park—produced about 113,000 metric tons (nearly 125,000 English tons) of organic coffee.

Coffee growers who obtain organic certification reap substantial rewards in the price they receive for processed beans. Depending upon the origin of the coffee, a price premium can range from \$0.15 to \$0.45 per pound. Of course, the cost of the certification must be accounted for as well, which normally hovers around a penny or two per pound. So, from a strict money-in, money-out standpoint, going organic pays for itself.



Rainforest Alliance



Rainforest Alliance Certified (RAC) is a program managed by the New York-based international environmental group Rainforest Alliance. Formed in the 1980s, this group has had a significant impact on agricultural production attitudes related to an array of crops, ranging from coffee, tea, and cacao (cocoa) to bananas, citrus, ferns, and cut flowers. As a non-governmental organization, it has forged relationships with local environmental groups throughout Latin America and other regions, creating what it calls a "Sustainable Agricultural Network."

For coffee, RAC criteria encompass both social and ecological concerns. While not insisting on organic certification as one of its production-level criteria, it does promote an integrated pest management approach of using smaller amounts of less-toxic synthetic agrochemicals than is typical of coffee farms. RAC's habitat-related criteria for coffee farms are more stringent than those of the USDA program. For instance, there must be at least 12 different native species of shade trees per hectare (or 2.47 acres), and the foliage cover must be at least 40 percent and form two layers to better mimic the differing canopy layers formed by natural forest trees.

However, just as it need not be organic, a bag of coffee marketed as RAC may contain only 30 percent certified coffee, a strategy that expands RAC's reach and market exposure. In fact, the last year or two have seen tremendous growth in this certification. In 2006, some 210 RAC farms produced 115,000 metric tons of coffee on about 405,000 acres of land. The bulk of RAC coffee hails from Latin America, where Brazil and Colombia dominate, but farms in Indonesia, Ethiopia, and Tanzania have also earned the RAC seal.

Fair Trade



Fair Trade certification is primarily concerned with social justice and targets mostly groups of small farms organized into democratically run organizations. This program's certification criteria promote empowering small farmers to compete in the global marketplace and improving the lives of farmers, farm workers, and their communities, which includes protecting the environment. In addition to coffee, Fair Trade certifies tea and herbs, cocoa and chocolate, fresh fruit, sugar, rice, flowers, honey, and vanilla. Producer groups receive a guaranteed floor price of \$1.26 per pound of coffee, and more if it is certified organic. Growers receive payment, and a portion of the income goes into projects that benefit the entire community—such as improved schools, clinics, and roads.

Fair Trade certification requires no particular type or pattern of vegetation on coffee farms to make them good wildlife habitat, but most Fair Trade coffee is shade-grown (as is most coffee grown by small farmers). Like RAC coffee, Fair Trade coffee is not necessarily organic, but certification requires farmers to use more environmentally friendly integrated pest management and implement other sustainable practices. Any package of coffee labeled Fair Trade is 100 percent Fair Trade—just as any package labeled organic must be 100 percent organic.

Fair Trade certification is also growing rapidly among farmers and in the marketplace. For coffee alone in 2006, about 230 Fair Trade farms on more than one million acres (417,000 hectares) produced 34,000 metric tons, a fairly low yield that is typical of small farms.



Sweet-smelling blossoms produce the coffee plant's flavorful seeds.



Getting Easier to be Green?

Labels indicating that products meet certain standards for quality and safety, such as USDA inspected stickers on meat, have a long history.

More recent is the proliferation of labels and logos promising how this or that product contributes to the social good—be it human health, humane treatment of farm animals, protecting wildlife, or doing less harm to the environment. No longer can careful shoppers simply compare trusted brand names and try to get the best value for their bucks, at least not if they want to match their consumption to their conscience. But do eco-labels make it easier to be green? Yes and no.

Unfortunately, not all labels are created equal. A few, such as USDA Certified Organic and the U.S. Environmental Protection Agency's Energy Star label, are both highly regarded as meaningful and trustworthy and are well known to consumers. According to a recent survey, 70 percent of U.S. households are aware that the Energy Star label indicates that a product is more or less energy-efficient.

But what about all of the other eco-labels? Do they really stand behind what

they seem to represent? Is the label backed by independent organizations or is it merely an industry marketing device? To help conscientious consumers sort this out, the Consumers Union's Consumer Reports Greener Choices website (www.greenerchoices.org/eco-labels) describes and rates more than 100 eco-labels based on seven criteria such as meaningfulness, verifiability, consistency, and transparency.

Bird Friendly for coffee and Fair Trade and Rainforest Alliance for a variety of foods all get high marks across the board. So does Certified Humane, which is found on eggs and meat and addresses the welfare of farm animals. In contrast, the Cruelty Free label found on cleaning products and personal hygiene products gets a failing mark from Consumer Reports. A Cruelty Free sticker would suggest that a product was not tested on animals, but Consumer Reports notes that this rating is "not meaningful and is potentially misleading to con-

sumers." Certified Vegan and Marine Stewardship Council certification of sustainable seafood get mixed but generally positive reviews. In the arena of sustainable forestry for wood and paper, Green Seal certification is rated highly favorably, Forest Stewardship Council (FSC) certification slightly less so. (Full disclosure: The paper *ZooGoer* is printed on is FSC-certified.)

Not included in the Consumer Reports roster are eco-labels and certifications now being attached to various sectors of the tourism industry to promote responsible ecotourism and eco-friendly hotels, as well as to real estate brokers, house-cleaning services, and more.

Even if these programs aren't perfect—even if they are no more than clever marketing—their growth is a hopeful sign that people increasingly care about protecting the planet. Putting that care into action by choosing products based on their eco-labels is tricky. If a label is not backed by reputable organizations and doesn't meet standards such as those used by the Consumers Union, it's probably wise to follow the old adage, caveat emptor—let the buyer beware.

—Susan Lumpkin

Utz Certified



The Utz-Good Inside coffee-certification program, based in the Netherlands, was founded by Guatemalan coffee producers and a Dutch coffee-roasting company. Some industry analysts view the Utz program as a response by large growers and their business allies to the Fair Trade movement's growth trajectory and success. Its criteria address good agricultural and business practices as well as social and environmental concerns, including a major requirement that prevents deforestation in the two years before a farm can be registered. But overall the certification process is less stringent and allows many growers to be certified who might not otherwise qualify for other certifications. The purity standard for the Utz certification demands that at least 90 percent of the label's coffee be certified. Regardless of its motivational underpinnings and somewhat weaker standards, Utz-Good Inside is, like other initiatives, getting consumers involved in thinking about how their food is produced. This seal, however, is not yet widely seen in the United States.

Starbucks' C.A.F.E. Practices



Starbucks' C.A.F.E. Practices—a set of criteria for how the coffee giant purchases coffee—is not a certification program, but it has similar goals. The acronym stands for “coffee and farmer equity.” The program seeks to purchase coffee produced according to a set of guidelines that Starbucks developed to address coffee quality, financial transparency, working conditions, and environmental issues. The guidelines specifically address coffee farms as wildlife habitat, calling for 75 percent local species, at least two of which have been shown to contribute to conservation, 40 percent foliage cover as an ideal, and two shade-canopy layers where possible.

The growth of Starbucks over the last decade has been nothing if not spectacular, witnessed by its voracious purchasing of coffee throughout the world. Its total coffee purchases topped 160 million metric tons in 2006, with about six percent being Fair Trade coffee. Its C.A.F.E. Practices program alone grew 430 percent between 2004 and 2007, accounting for around 65 percent of the latest year's supplies, most from Central and South America, and especially Costa Rica. More recently, Starbucks has moved the sustainable coffee program into Ethiopia. You can't tell whether or not a given bag is filled with coffee from the farms in the C.A.F.E. Practices program, or is mixed with other coffee, but if it is organic, Free Trade, or both, the label will show it.

Smithsonian's Bird Friendly



The Bird Friendly (BF) certification mark, developed by SMBC, hinges on the concept of “shade-coffee-as-habitat,” focusing on the biophysical aspects of the production area. What also sets it apart from the other programs or certifications is that it grew directly out of scientific field work. From the years of work on the shade-coffee issue, the SMBC staff developed a set of criteria that define what a good shade-coffee farm is from a bird's eye view.

Some refer to the BF criteria as the “gold standard” for shade-grown coffee. The criteria are more detailed and stringent than those of other programs. For instance, they specify that there must be at least 11 species of canopy trees and that the main canopy must be at least 40 feet tall. Additionally, the production area must have at least a 40 percent foliage cover that forms three forest layers. The coffee also must be certified organic. Farms displaying these characteristics provide habitat for migrants such as the Blackburnian warbler (*Dendroica fusca*) and the Baltimore oriole (*Icterus galbula*), as well as resident species such as the blue-crowned motmot (*Momotus momota*) and the masked tityra (*Tityra semifasciata*).

SMBC's realization that coffee farms could provide quality habitat for many birds made its way to the specialty coffee industry in 1996, when this research unit organized and hosted the “First Sustainable Coffee Congress” at the National Zoo, an event many consider an early signpost on the road to sustainable coffee. While coffee-industry analysts point to the SMBC as a major catalyst in pushing the specialty-coffee world to consider the ecological side of coffee production, the growth of BF has been slow compared to other initiatives. Part of this tortoise-like start derives from SMBC's small staff not being able to devote





Some shade-coffee farms provide sufficient habitat for birds such as the blue-crowned motmot (*Momotus momota*).

full-time attention to the program, and part of it is undoubtedly due to the stricter criteria involved. However, BF certification is growing, and continued expansion in North American and Japanese markets—coupled with recent interest in Europe—should result in a secure footing for the BF seal.

BF coffee's cachet among hard-core birdwatchers and environmentalists continues to grow as more and more coffee drinkers learn of the science behind the seal and the ongoing attention the SMBC staff gives to this issue of conservation via the marketplace. The nearly 4,000 metric tons of BF coffee currently produced each year on 35 different farms come mainly from the New World tropics. In early 2008, the first African coffee was certified when an Ethiopian group received the BF stamp of approval for its shade management practices—only fitting, given that Ethiopia is the birthplace of all coffee.

Choices, Choices

So what, exactly, is a concerned consumer to do with such an attractive array of different programs?

If your greatest concern is social justice, go with Fair Trade. Simple.

If you worry about agrochemicals in your food—either because of personal health or that of the planet—the only sure way to avoid them is the USDA Certified Organic certification, alone or coupled with another certification.

If you most want to contribute to conserving habitat for birds and other wildlife, Rainforest Alliance or Bird Friendly coffee is the way to go.

Or, use your purchasing power to address all three and look for “triple certification.” Triple certification assures consumers that the coffee they’re buying is socially certified for fair prices to growers, organically certified for residue-free coffee that’s produced without agrochemicals, and habitat-certified to ensure coffee farms that promote and preserve local and migratory bird diversity.

Caffe Ibis, for example, is a roaster with national reach that specializes in triple-certified coffees. The Logan, Utah-based company has found a popular niche among socially and environmentally conscious java fans. Embracing the Fair Trade, USDA

Certified Organic, and Bird Friendly certifications, Caffe Ibis has developed a loyal following among the likes of Whole Foods Markets, high-end restaurants, neighborhood cooperatives, and other outlets. And customers can buy the triple-certified coffee online at www.caffeibis.com.

Such coffees provide North Americans with an affordable entry into the often-distant worlds of ornithological research, good land stewardship in the tropics, and a constellation of innovative efforts spanning latitudes, cultures, and landscapes. Like the migratory birds that benefit from such certified farms, the coffee produced there links us to responsible producers and provides an avenue connecting conservation to the marketplace. And if you let your mind wander while you sip a triple-certified latte and watch birds outside your kitchen window, you might be able to imagine you’re seeing them in the cool forest-like setting of a shade-coffee farm. 

—Robert A. Rice is a geographer at the Smithsonian Migratory Bird Center, a research unit at the National Zoo.



Amid
the
dust
of
battle
there
is
no
time
to
waste.
Time
is
life.

ing
beats
way.

—Young Americans

a trunk full of MEMORIES

AS AMBIKA TURNS 60, WE CELEBRATE OUR ASIAN ELEPHANTS AND WHAT THEY'VE TAUGHT US OVER THE YEARS

by Cindy Han

It was 1961 when a large gift arrived here at the Smithsonian's National Zoo—an Asian elephant (*Elephas maximus*), given to the children of the United States from the children of India. The young female, Ambika, was a relatively dainty adolescent back then. She had spent her early years in India's Coorg Forest, then was captured and put to work at a logging camp. Elephants have traditionally been used in India to help with the heavy lifting of felled trees.

But things changed for Ambika. Since coming to the National Zoo almost 50 years ago, she has received daily care, from baths to nutritious meals to exercise. She has learned to relate to the other elephants in the herd, going from the youngster in the bunch to the responsible elder that she is today. She has helped advance the knowledge that



scientists have about elephant behavior and physiology, particularly now that she is one of the oldest elephants in North America.

During her time here, Ambika has been growing, learning, adapting, and aging well under the care of the Zoo's staff. The fact that she has reached this mile-

stone is a testament to our commitment to the care of Asian elephants. From the keepers who work with her daily to the plumbers who service the Elephant House to the nutritionists who select her diet—it takes an entire zoo to raise an elephant. And in return, we're rewarded with countless priceless moments that remind us of how special these animals are.

Ambika—with her distinctive pink trunk, her social nature, her particular habits, and her signature smile—is truly a gift.



Ambika is known for seeking out social interaction, both with people and other elephants—and she can act sulky if she doesn't succeed at getting attention. Thanks to her tendency to sneak quietly up to people, Ambika has earned a couple of nicknames from her keepers: "Sneaky Biki" and "Space Invader." As keeper Debbie Flinkman (shown with Ambika) describes, "You'll be standing there and, before you know it, she's inched closer and closer to you, and just starts to lean on you. And you never hear her coming!"

Elephants can move about more silently than you would expect for such large creatures, in part due to the way that their thick foot pads cushion their steps and absorb their weight.



A frothy morning scrub not only keeps the elephants clean and conditions their skin, it also conditions them to handling by humans. That way, when it comes time for a medical exam or procedure, the elephants are already accustomed to being touched. A dedicated team of keepers as well as FONZ volunteer aides help maintain a regular routine for the Zoo's elephants. (Marie Galloway and Sean Royals shown here.)

The bathing beauty in this photo is Toni, who died in 2006. During Toni's time here at the Zoo, Ambika's role in the herd evolved to one of more leadership and responsibility for the others' well-being—typical behavior for the matriarch of a herd in the wild.

Photo upper left by Meghan Murphy/NZP; other photos by Jessie Cohen/NZP

HOOKED ON ELEPHANTS

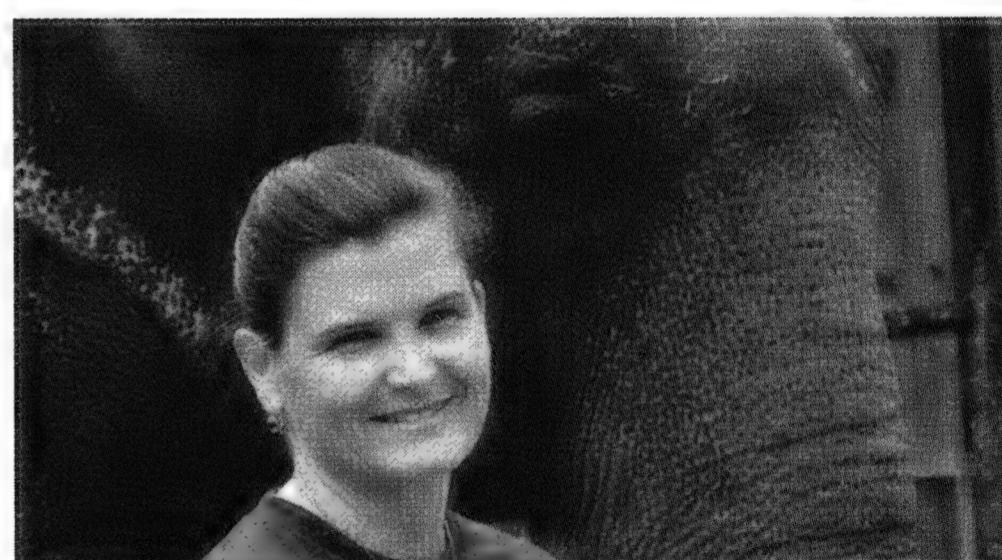
by Janine Brown

When I was growing up, my favorite stuffed animal was an elephant named Dumbo. By the time I started high school, he had no eyes and almost no stuffing in his trunk. Little did I know that many years later I would become an elephant expert.

I wish I could say that was my plan all along, but it wasn't. In graduate school, I studied reproduction in dairy cattle and became an endocrinologist—a person who studies hormones. By 1988, I was working at the Uniformed Services University in Bethesda, Maryland, when I got a call from the Smithsonian National Zoo's elephant manager asking if I could measure hormones in elephants. At the time, the Zoo had three Asian elephants—Shanthi, Ambika, and Toni—and one African elephant, Nancy. I had no idea how to work with elephants, but I said "yes." The goal of the study was to find out if Shanthi, then 12 years old, had reached puberty. I

played around with several techniques I had learned in graduate school and found an assay that could measure progesterone, a major reproductive hormone. The keepers would send blood samples from all the elephants to my new lab at the Zoo's Conservation and Research Center (CRC) in Front Royal, Virginia. I was able to determine that Shanthi's hormones did indicate that she had reached puberty, and she was sent off to Syracuse, New York, to breed with a bull named Indy.

By that point the work had really piqued my interest. Back then, we knew almost nothing about the reproductive biology of elephants, especially their hormones. By examining all of the elephants at the Zoo, I found that the elephant has the longest fertility cycle of any mammal—about 3 to 4 months. I was intrigued by the variability in cycle lengths among the three Asian female elephants; Ambika had the shortest at 14 weeks, Toni



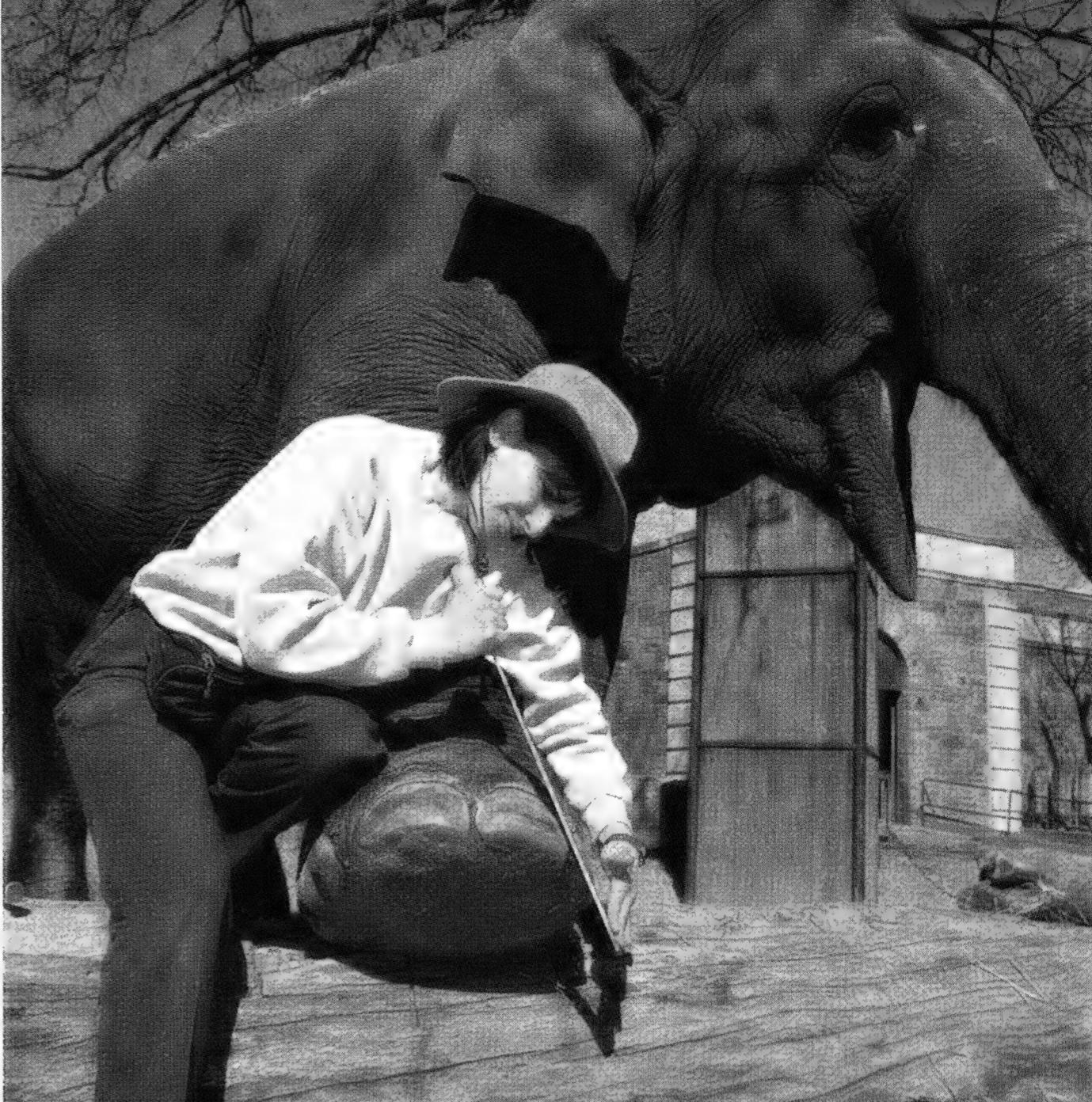
the longest at 17 weeks, and Shanthi was in between at 15.5 weeks. Nancy, on the other hand, was not cycling at all, and she was producing milk from her mammary glands despite the fact that she had never been bred. This was very strange. What could it be? I knew of only two hormones that could initiate milk production: estrogen and prolactin. We determined her estrogen levels were normal, so we focused on prolactin. After a year, I developed an assay to measure prolactin in elephants. It turned out that Nancy did indeed have elevated levels of prolactin, which meant she would never conceive.

By this time, Shanthi was pregnant in Syracuse, so I decided to monitor her



As the two adult elephants now at the Zoo, Ambika and Shanti interact well and keep each other company. They've been through a lot together. Years ago, the Zoo held an annual post-Halloween "pumpkin stomp" for the elephants, where visitors could watch as truckloads of pumpkins would be brought in for the elephants to step on and eat. It was an enrichment activity that offered the animals physical and mental stimuli, and it was a nutritious treat to boot.

What visitors did not get to witness was the day-after reaction. Keeper Debbie Flinkman describes how the morning after one pumpkin stomp, Ambika took one look at the field of smashed pumpkins before her and went running and sliding through them, flinging them with her trunk, and trumpeting loudly. "She will raise her trunk and produce the most beautiful sound," says Flinkman. "It sounds so glorious and joyful."



A 9,000-pound elephant getting her nails done? Keeping an elephant's feet in good condition and free of infection is actually an important part of elephant husbandry, which includes their daily care, feeding, exercise, training, and mental stimulation.

Here, keeper Marie Galloway, who has been with the National Zoo since 1987, helps trim the toenails of Shanti, the Zoo's largest Asian elephant. Shanti came to the Zoo from Sri Lanka in 1976, and is the mother of Kandula, the Zoo's young male elephant.

pregnancy. This monitoring led to some important findings that have made our Zoo a leader in elephant reproduction. First, we found out that our new prolactin assay was perfect for diagnosing pregnancy. We also learned that progesterone declines to baseline two to five days before birth, which meant we could predict the time of an elephant calf's birth quite closely. This measure has since become a vital birthing management tool. Another big development was our discovery of a unique hormone pattern in elephants that lets us predict three weeks in advance of when a female is going to ovulate. This knowledge is key to timing artificial insemination (AI), and is how we enabled Shanti to become pregnant with our young male Asian elephant Kandula.

As the National Zoo became known for our work on elephant reproduction, other zoos contacted me to assess their female elephants, too. Then the Elephant Species Survival Plan committee asked me to be its

reproductive advisor to help identify viable breeding candidates. By 1994, I established a "fertility clinic" that focused specifically on elephant reproductive health. Our team now monitors more than 120 female elephants at some 30 institutions. We help zoos determine if their females are cycling normally, when to time natural mating or AI, if an elephant is pregnant, and when she is going to give birth.

This year, as Ambika turns 60, we continue to learn from her. As one of the oldest Asian elephants in North America, and the oldest one being hormonally monitored, she is helping us determine whether elephants experience menopause like humans do. We know reproduction slows down in wild elephants once they reach about 50 years of age, but based on what we see with Ambika, they may not actually stop cycling. She continues to plug along with her 14-week cycles. With 20 years of hormone data on Ambika, she is one of the best-studied elephants in the world.

As for me personally, the best part of my job has been getting to know our elephants. Each one is unique. Shanti is a bit lazy, but well-tempered and a terrific mother. Ambika is reserved, but is also known to have a stubborn streak. My favorite story about Ambika is when we made elephant footprints several years ago for a fundraiser. We had to paint the bottom of the elephants' feet and have them step on a piece of paper. Shanti dutifully stamped out several dozen footprints. Ambika, on the other hand, would start to put her foot down, but as soon as she was close to the paper she would suddenly move it away. We ended up with many partial footprints and finally gave up. By the twinkle in Ambika's eye, she knew exactly what she was doing.

Our elephants and those I work with throughout the country are my extended family. I am so proud to be part of the elephant program at the National Zoo, and wouldn't want it any other way.



From the time Kandula was born in 2001 (shown here with tubs), he has delighted Zoo visitors with his playful antics. For Ambika, who has never been a mother, adapting to this rambunctious new youngster has been a gradual process. She looks after him, but at the same time, she'll stop him from pestering her too much. Sometimes, a good head butt is the only way to make your point.

An elephant's trunk has an amazing 150,000 muscle units and tendons, which enable it to make very specific maneuvers. Ambika, a persnickety eater, puts her trunk muscles to work to arrange her food. She uses the tip of her trunk to separate her grains just so, while simultaneously pushing some hay with another part of her trunk.

Ambika is also a whiz at using her trunk to toss sand up and over her back so that it covers every inch of her body. Elephants do this instinctively to protect their skin from insects and the sun's rays, but Ambika seems to get some fun out of it, too.

It's been a full and varied life for Ambika here at the National Zoo, and we celebrate her 60th year with gratitude for all that she has shared with us.

Is a Whale a Fish?

Trying Leviathan: The Nineteenth-Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature

D. Graham Burnett. 2008. Princeton University Press, Princeton, New Jersey. 266 pp., hardbound, \$29.95.

Is a whale a fish? Of course not. A school-aged child will answer with confidence that a whale is a mammal—and smugly correct the misguided soul who says otherwise. So it's hard to imagine what a radical taxonomic assertion this was in 1819, when the outcome of a sensational trial in New York City, *Maurice v. Judd*, hinged on just this question.

The New York state legislature had recently enacted a law dictating that fish oil be inspected for quality and purity prior to its sale. Fish oil purveyors had to submit their barrels for inspection—and, of course, pay a fee to the inspector for the privilege. Maurice, New York City's fish oil inspector, was suing Judd, a seller of whale oil who failed to submit his product for inspection; Maurice wanted to recover his fees and the statutory fines. In his defense, Judd argued that whale oil was not fish oil, so no inspection of his goods or payment of inspection fees was required. Both sides were represented by some of New York's most high-profile lawyers, and the public followed the case with the avidity of *American Idol* fans.

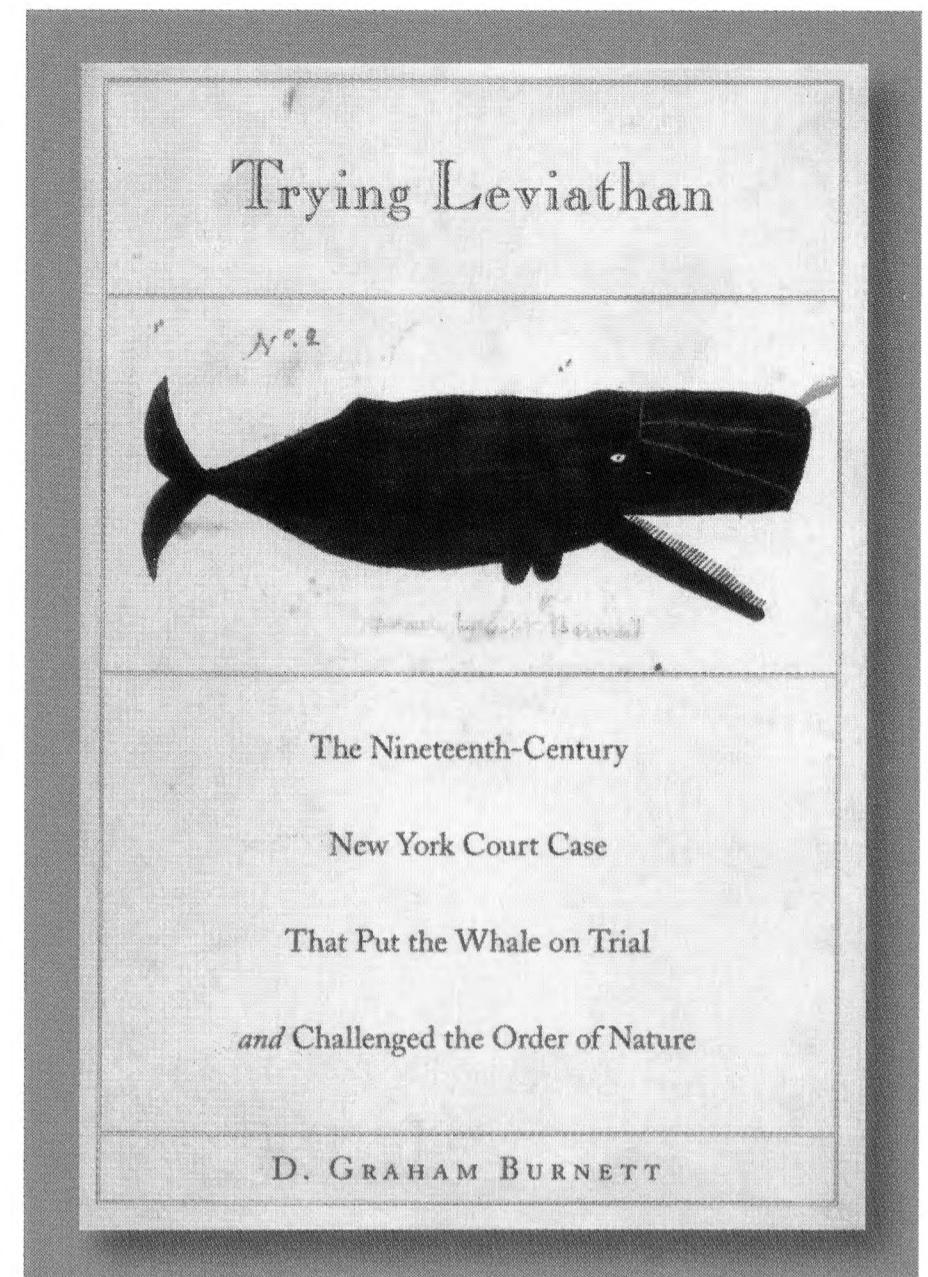
In *Trying Leviathan*, Princeton University science-historian D. Graham Burnett puts this complex case in the social, political, economic, and, particularly, scientific context of the time, about midway between Linnaeus's 1758 *Systema Naturae* and Darwin's 1859 *The Origin of Species*.

The defense's star witness was one Samuel Latham Mitchill, an eminent New York natural philosopher who tried to teach his fellow New Yorkers the still-controversial science of Linnaean taxonomy based on classifying species according to their internal anatomical similarities—which make a

whale decidedly not a fish. In contrast, according to the taxonomy codified in Genesis, which divided animals into those that swam in the deep, crept on land, and flew in the sky, a whale was obviously a fish. When it called Mitchill, the defense believed his scientific authority would make short work of the plaintiff's case. Instead, poor Mitchill was literally laughed out of the courtroom and made to look ridiculous in the court of public opinion for years to come.

The plaintiff's lawyers made much of the fact that Mitchill was happy to admit that there was disagreement even among philosophers about the new classification scheme, reminiscent of creationists who use disputes among evolutionary biologists to suggest that evolutionary theory in general is wrong. They also played on Mitchill's including man among the primates and by extension making whales more like men than fish. But equally damaging was that a whale not being a fish simply defied common sense.

It's not that most people who knew anything about whales were ignorant of the features that Mitchill cited as evidence that whales were mammals, such as breathing air and giving birth to live young that were fed with milk. For instance, the whalers called to testify on the question knew that. But, as Burnett explains, those features were simply not salient to how most people classified animal life. Similarly, after science was defeated on the stand, the defense took another taxonomic tack on the case that made much more sense to the jury. They argued and called merchants to testify that, regardless of whether whales were fish, whale oil and fish oil were entirely different commercial products, with different uses and sold



at different prices. A customer who ordered fish oil would not expect to receive whale oil and vice versa.

In the end, though, the plaintiff won his case by appealing to regional prejudices: Many of the witnesses for the defense were "easterners" from Boston and such parts, and a jury of New York Knickerbockers proved loath to kowtow to such foreign ways of thinking and speaking. Ultimately, however, the wording of the statute was changed soon after the trial to exclude whale oil from inspection—not because science finally triumphed but thanks to the influence of whale oil merchants whose profits suffered from paying the inspection fees.

Burnett concludes with a thought-provoking discussion of why scientific taxonomy finally prevailed—why everyone now knows that a whale is not a fish—and how that might not have been for the best. Fascinating, challenging, rich in historical detail, and sometimes very funny, *Trying Leviathan* is a whale of a tale.

—Susan Lumpkin

Lizards and Evolution: Both Speedy

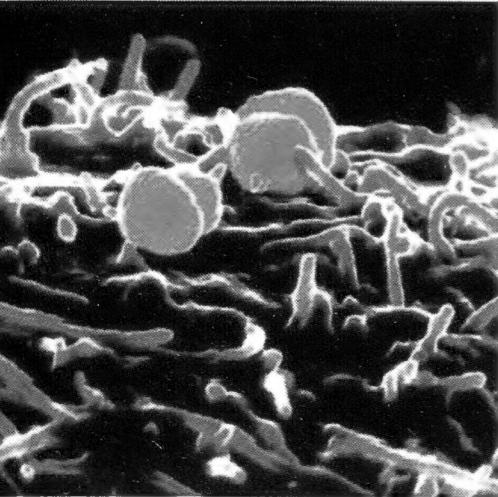


Lizards on a Croatian island are making a case for the idea that evolution can occur in a matter of decades instead of slowly, over millennia. In 1971, biologists moved five adult pairs of Italian wall lizards (*Podarcis sicula*) from one island in the Adriatic Sea to another. From 2004 to 2006, a team returned twice a year, capturing and studying members of the new lizard population, which had grown to about 5,000 individuals. Genetically, the lizards appeared identical to those on their island of origin, but over 35 years, the castaways changed from a diet of insects and some plants to a diet mostly composed of plants. In the process, the lizards evolved new structures called cecal valves that create fermentation chambers in the gut, enabling them to better digest plant matter. Head size and bite force also increased, features that would aid in the crushing of tough stems and leaves.

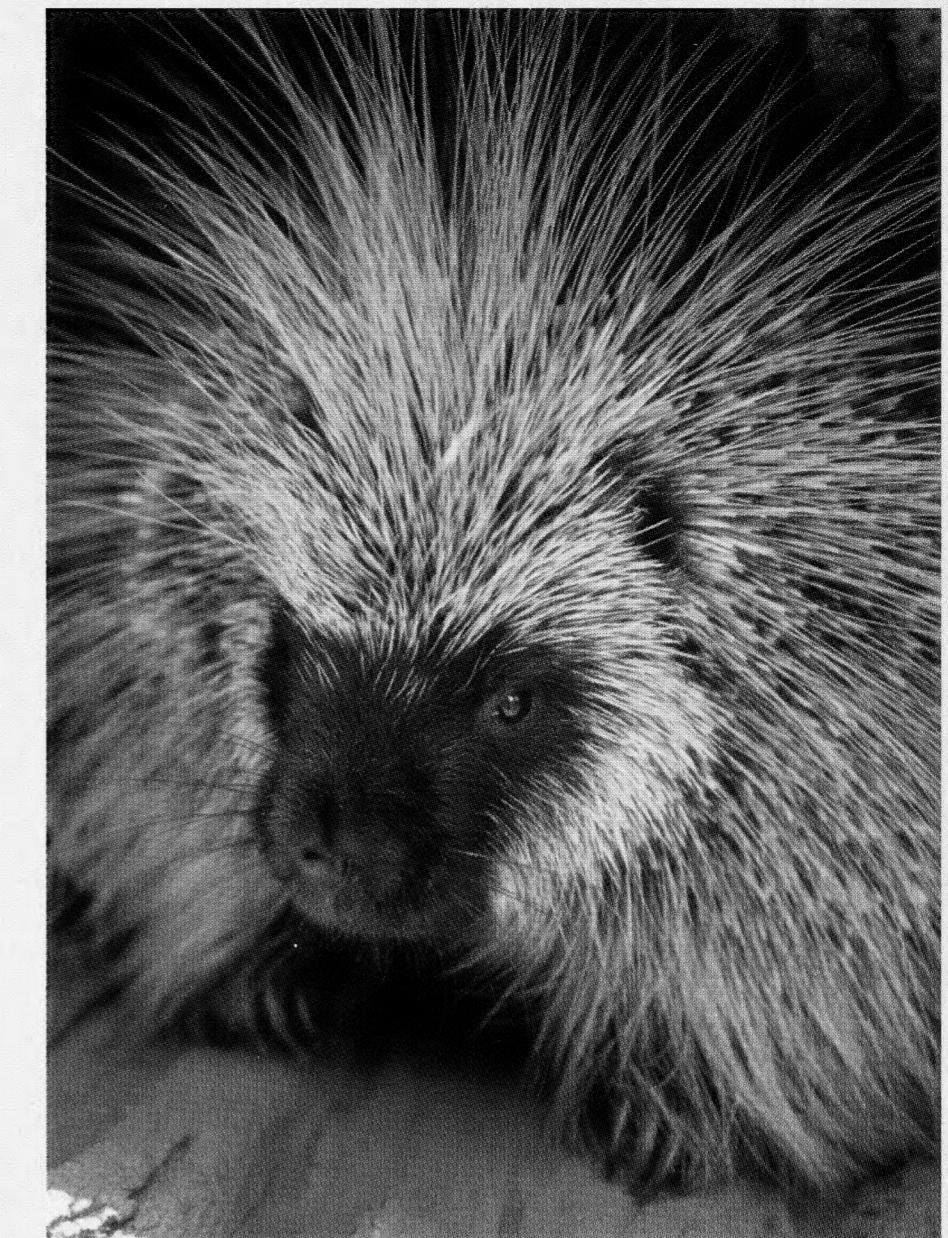
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What's in a Name?

The black-footed ferret (*Mustela nigripes*) is a charming creature, but its name and those of its relatives in the family Mustelidae suggest otherwise. The word ferret comes from the Old French word *fu(i)ret*, which means "little thief," from the Latin *fur*, a thief. The European ferret (*M. putorius*) is also known as a polecat, probably from the Old French word, *pol*, later *poule*, for chicken: in other words, a chicken-stealing cat. Their genus name, *Mustela*, is interpreted as either "mouse killer" or "long mouse," from the Latin words *mus*, mouse, and *telum* for weapon or spear, and hence killer, or long, like a spear. The black-footed ferret's species name, *nigripes*, simply means black-footed in Latin, but its European cousin is saddled with *putorius*, Latin for stinking or putrid. All mustelids, often referred to as weasels, possess large anal glands that secrete odiferous chemicals. The ancient Greek comic playwright Aristophanes used this characteristic to describe a woman in terror: "she let flee a fart in her fear which stank worse than a weasel."



When you think of strong creatures, elephants might come to mind. But pound for pound, the world's strongest organism turns out to be *Neisseria gonorrhoeae*, the bacterium that causes gonorrhea. These microscopic beasts pull on the human cells they infect with thread-like appendages that collectively exert forces more than 100,000 times their body weight—equivalent to a 10,000-pound elephant dragging an object weighing five million tons.



Do Porcupines Throw Their Quills?

A North American porcupine (*Erethizon dorsatum*) is studded with about 30,000 barb-tipped quills. If the sheer threat of these quills doesn't deter a predator, then the porcupine might be called to put them to use. But a porcupine doesn't throw its quills. Instead, the large rodent must drive its quills into the predator, actually attaching itself to its nemesis temporarily. The quills then move deeper into the assailant's body, and it takes some force for a porcupine to let go of its quills. Predators penetrated by porcupine quills may die of trauma or from infection associated with their wounds.

Surprisingly, porcupines fall out of trees quite often and are at risk of impaling themselves on their own weapons. But their quills are coated with greasy fatty acids that have antibiotic properties, and so the quills tend to pass through the skin, move through the body, and pass back out of the porcupine's skin, often without causing much harm.

Fact or Fiction: Nighthawks are Hawks... or Goatsuckers?

From about the last week of August to the first week of September, look up into the dusk sky and you will see them. Zipping past baseball stadium lights, or in groups over suburban rooftops, common nighthawks (*Chordeiles minor*) put on their annual late-summer migration show. Glance at one of these birds and you might assume it's a raptor: the strong flight, the long angular wings with white slashes. In fact, nighthawks are not hawks, but members of the nightjar family Caprimulgidae, Latin for "goatsucker." This misnomer likely derives from the insect-eating nightjars' habit of swooping near livestock to snap up prey flushed by roving hooves.

Italian wall lizard, Tony Phelps/naturepl.com. North American porcupine, Jessie Cohen/NZP. Gonorrhea bacterium, Ian Boulton.



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